

# AGRICULTURE

# THE SCIENCE AND PRACTICE OF BRITISH FARMING

BY

### JAMES A. S. WATSON

Chief Education and Advisory Officer Ministry of Agriculture and Fisheries

AND

# JAMES A. MORE

Reader and Director of Studies in Agriculture, University of Edinburgh

0 BRITSH COUNCIL

EIGHTH EDITION-REVISED AND ENLARGED

OLIVER AND BOYD EDINBURGH: TWEEDDALE COURT LONDON: 98 GREAT RUSSELL STREET, W.C. 1

# For the use of H.M. Forces NOT FOR RESALE

PRINTED AND PUBLISHED IN GREAT BRITAIN BY OLIVER AND BOYD LTD., EDINBURGH

# CONTENTS

# PART I

### THE SOIL AND ITS MANAGEMENT

CHAP.				PAGE
Ι.	The Soil	•		I
II.	SOIL FERTILITY AND PLANT LIFE .			23
III.	LAND RECLAMATION AND IMPROVEMEN	т.		40
	MANURES AND MANURING			63
v.	IMPLEMENTS AND CULTIVATION .			98

### PART II

#### CROPS

I.	THE CEREALS							186
II.	ΤΗΕ ΡΟΤΑΤΟ						1	239
III.	THE ROOT CROPS				•			282
IV.	SUGAR-BEET .							307
V.	PULSE CROPS AND	FLA	x					321
VI.	FORAGE CROPS AN	D So	ILAGE					336
VII.	GRASSLAND .					•	•	359
TITV	THE CONSERVATIO	NOF	FODI	DER				415

#### PART III

-

#### FARM LIVE.STOCK

· I.	THE PRINCIPLES	SOF	BREED	ING					438
II.	THE PRINCIPLES	S OF	NUTRI	TION					473
	CATTLE-TYPES				•				509
IV.	BREEDING AND	RE	ARING	OF	CATTL	E-M	ILK	AND	
	BEEF PRODU								541
v.	SHEEP AND GO.	ATS		•			- •		576
VI.	Horses .			•		•		•	628
VII.	Pigs			•		•	•	•	657
VIII.	FARM POULTRY	•	•	•	•		•	•	687

VII

#### CONTENTS

### PART IV

#### FARM ORGANIZATION AND MANAGEMENT

CHAP.									PAGE
I.	LAND	AND I	TS E	QUIPM	IENT		× .		713
II.	THE (	Сногси	C OF	FARM	ENT	ERPRI	SES		 763
III.	SYSTE	MS OF	FAR	MING					800
		OF							
	E	FFICIE	NCY						843
v.		ETING							853
								100	
APPEN	NDIX						· .		861
							1		
INDEX	ς.					1.	-17		 877

viii

# INDEX

ABERDEEN-ANGUS cattle, 461, 524 Absorption, 13 Acclimatization of sheep, 618 Acidity, soil, 14 Agricultural Index, 816, 837 lands, 723 Air, 27 A.I.V. silage, 437 Albuminoid ratio, 501 Alsike clover, 375 Amino-acids, 475 Anæmia in pigs, 681 Aphides, 279, 321 Arab horse, 637 Arable farms, examples, 819, 829 Artificial drying of fodder, 419 insemination, 440 Ascorbic acid, 486 Asses, 656 Ayrshire cattle, 482, 535 " BABY beef," 546, 569, 572 Bakewell, Robert, 459 Balance of ration, 502 Bare fallow, 139 Barley, 225, 797 cultivation, 229 diseases, 234 malting, 225 manuring, 232 quality, 226 threshing, 162 varieties, 227 Basic slag, 72 Bates's Shorthorn cattle, 521 Beans, 34, 321, 768, 797 threshing, 163 Beef, 513 cattle, 520 production, 569 quality, 513 Beet ploughs, 109 Belgian horse, 645 Belted Galloway cattle, 529 Bent-grass, 361 Berkshire pig, 666 Binder, 152 Biological values, 476 Blackface sheep, 597 Blight, 275

Blue Albion cattle, 532 " Bobby " calf, 544 Bone manures, 71 Booth's Shorthorn cattle, 521 Bordeaux mixture, 266 Border Leicester sheep, 584 Boron, 26, 79 Bracken, 137 Breeding, principles, 438 British Friesian cattle, 533 Broadcast sowers, 144 Buildings, 729 Bulk of ration, 504 Bulls, Licensed, numbers, 540 Bunt of wheat, 203 Bush sickness, 474 Butter, place in farming system, 784

CABBAGES, 345 production for stock, 794 Cake breakers, 180 Calcareous soils, 21 Calcium, 25 Calcium cyanamide, 68, 142 Calf housing, 551 rearing, 542, 785 Calorie, 487 Capital, 728, 755 Carbohydrates, 478 Carotene, 482, 543, 561 Carrots, 303 Carts, 184 Cattle, 509, 781 breeding and rearing, 541 breeds, 520 commercial types, 538 conformation and quality, 513 feeding for beef, 502, 569, 786 grazing habit, 406 place in farming system, 781 points, 515 Cellulose, 479 Cereals, 186 Chaff cutter, 177 Chain harrow, 124 Chalk, 96 Cheese, place in farming system, 783 Cheviot sheep, 599 Chromosomes, 441, 472

#### INDEX

Clay, 8 loams, 18 soils, 17, 45 Clean-milk production, 565 Clipping horses, 655 Clover, 33, 373, 402 seed production, 377, 776 Clun Forest sheep, 596 Clydesdale horse, 642 Coates's Herd Book, 522 Cobalt, 26, 80 Cocksfoot grass, 366 Cod-liver oil, 483, 543, 547, 548, 706 Colling's Shorthorn cattle, 521 Colorado beetle, 279 Colostrum, 543 Combine harvesting, 163 Compost, 22 Compound manures, 77 Concentrated fertilizers, 77 Copper, 26 Copper sulphate spraying, 141 Corpus luteum, 438 Corriedale sheep, 587 Costs, 739, 843 Cotswold sheep, 587 Coulter, 104 Cow-sheds, 564 Cows, feeding of, 503, 556 Crested dogstail, 372 Crops, 186 cutting, 149 rotation, 802, 833 Cross-breeding, 469 Cruickshank's Shorthorn cattle, 522 Cultivators, 116 action of, 129 rotary, 125 Cumberland pig, 668 " Cutlift," 424 Cyanamide, 68 DAIRY cattle, 533 Dairy farm, example, 826 Dairy Shorthorn, 523 Dairy type of cow, 518 Dales pony, 639 Dartmoor pony, 639 sheep, 602 D.D.T., 305 Derbyshire Gritstone sheep, 599 Devon cattle, 527 Closewool sheep, 596 Longwool sheep, 587 Dexter cattle, 538 Digestibility of food, 491 Dipping sheep, 616, 619 Disc harrow, 124 plough, 108 Diseases, control of, 815

Dissolved bones, 72 Dorset Down sheep, 439, 593 Horn sheep, 439, 594 Downs, 361 Drag harrow, 122 Drainage, 47, 731 water, contents of, 13 Draw moss, 360, 612 Dredge corn, 237 Dried grass, 419, 796 Drilling machines, 144 Drying, artificial, 419 Dual-purpose cattle, 519, 529 Ducks, 710 Dung, 80 loaders, 148

EARLY maturity, 512 Eelworm, 224, 279, 312 Energy value of food, 487 Ensilage, 425 Essex pig, 669 Exmoor Horn sheep, 602 pony, 639

FALLOWING, 139, 807 Farm enterprises, 763 organization and management, 713 Farming systems, 800 examples, 816 Farms, stocking, 733 Farmyard manure, 80 application of, 84 synthetic, 86 Fats, 478 Feeding stuffs, classification of, 480 constituents of, 473 money values of, 506 Fell pony, 639 Fen, 41 Fencing, 730 Fertility, 36, 716, 808 Fertilizers, 63 placement of, 92, 146, 264, 316 Fescues, 368, 372 Fibre, crude, 480 Finger-and-toe disease, 293 Flax, 330, 775 Flushing sheep, 608 Foaling, 649 Fodder, conservation, 415 Food-preparing machines, 177 Food production for stock, 791 requirements of stock, 486 Foods, preparation, 562, 572, 621, 654, 684, 706 Foot-rot in sheep, 620 Forage crops, 336, 798 harvester, 155

Forest lands, 719 Frit-fly, 207, 223 GALLOWAY cattle, 528 Game, 718 Gammexane, 295 Geese, 711 Germ-plasm, 444 Gestation, 439, 542, 606, 647, 670 Gloucestershire cattle, 538 Old Spots pig, 668 Goats, 576, 626 Golden oat-grass, 372 Gout fly, 207, 234 Grading and crossing, 468 Grain, place in farming system, 763 storage, 166 Grass, dried, production for stock, 796 drying, 419 seed production, 377, 777 silage, 429, 796 Grasses, 360, 364 Grassland, 359, 724, 798 effect of grazing, 403 for hay, 396 for pasture, 400 management, 396 manuring, 397, 400 mechanical treatment, 408 seasonal variation, 393 seed mixtures, 380 Grazing, 403, 845 Grazing farm, example, 824 Green manuring, 89 Grinding machines, 177 Growth substances, 26 Guano, 87 Guernsey cattle, 482, 537 HALF-BRED sheep, 584 Hampshire Down sheep, 592 Harrows, 121 action of, 129 Harvester-thresher, 163 Hay, forage, 155, 396, 415, 752, 774, 795 cost of production, 846 loader, 170 management of grassland for, 396 sweep, 170 Haymaking, 415 machinery, 167 Heath, 43 Heather, 360 Herbage plants, quality of, 363 Herdwick sheep, 601 Heredity, mechanism of, 440 Hereford cattle, 526 Highland cattle, 529 pony, 639 Hill pasture, 359, 412

Hirsel of sheep, 611 Hoe, horse, 120 Hoggs. See Sheep Hops, 775 Horse breaking, 651 breeding, 647, 789 breeds, 636 clipping, 655 desirable qualities, 634 draft, 634 feeding, 652 fertility, 648 gaits, 630 heavy draft breeds, 640 labour for crops, 735 maintenance costs, 739 pack, 636 points of, 629 saddle, 632 shoeing, 655 Horse-fork, 171 Horse-hoe, 120 Horse-rake, 167 Horses, 628, 735 grazing habit, 405 licensed stallions, 646 Hosier, J. A., 569 Housing, cattle, 551, 573 cows, 564 horses, 655 pigs, 671 poultry, 700 sheep, 625 Humus, 9, 808 Hunter horse, 638 " Husk " (" hoose "), 551 Hygiene, 815

IMPLEMENTS, 98, 743 Inbreeding, 464 Incubation of eggs, 695 Index prices, 816, 837 Injurious substances, 28 Inoculation of lucerne, 342 Insemination, artificial, 440 Iron, 26 for pigs, 681 Irradiation, 484 Irrigation, 60 Italian rye-grass, 364

JERSEY cattle, 536

KAINIT, 76, 142 Kale, 351, 754, 794 Kellner, 491 Kent sheep, 588 Kerry cattle, 538 Kerry Hill sheep, 596 Kidney vetch, 377 Kohlrabi, 305

LABOUR, 758 seasonal distribution, 800 Lamb " creeps," 622 Lambing, 613 pen, 614 Land and its equipment, 713 Large Black pig, 667 Large White pig, 664 Large White Ulster pig, 669 Leaf-stripe, 222, 234 " Leather-jackets," 223 Leicester sheep, 582 Lignin, 479 Lime, 16, 94, 814 Lincoln Curly Coated pig, 668 Lincoln sheep, 586 Lincolnshire Red Shorthorn, 524 Linkage, 451 Litter, 81, 751 Litter-testing, 663 Live stock, 438, 746, 777 Live stock improvement, 457 Liver-fluke in sheep, 619 Loams, 18 Lodging in cereals, 237 Long White Lop-eared pig, 669 Longhorn cattle, 531 Longwool sheep, 582 Lonk sheep, 598 Lucerne, 34, 339

MAGNESIUM, 25, 79 Maintenance requirements of stock, 495 Maize, 354, 471 Malting, 225 Management, farm, 713 Manganese, 26, 79, 222 Mangold drill, 146 Mangolds, 296, 793 cultivation, 298 diseases, 303 growing for seed, 303 manuring, 300 varieties, 297 Manure distributors, 146 farmyard, 80 Manures and manuring, 63, 840 Manures, mixing, 91 placement, 92, 146, 264, 316 purchase, 89 residual value, 93 spreading, 146 Market gardens, 721 Marketing, 853 Marshes, 40

Meadow fescue, 368 foxtail, 370 grass, 371 hay, 398 Mechanized farm, example, 830 Mendel, Gregor, 445 Mendel's laws, 445, 449 Merino sheep, 577, 581, 587 Metabolism. See Nutrition Metabolizable energy, 488 Middle White pig, 665 Milk, 782 colour, 482 effect of food on composition, 561 efficiency of production, feeding for, 503, 556 Marketing Board, production, 514, 553, 782 production costs, 848 production of clean, 565 recording, 553 substitute, 547 yield, estimation of, 555 vields, 464, 553 Milking, 566 Milking capacity, signs of, 516 Mineral deficiency, 474 phosphate, 74 Minerals for cows, 475, 560 for pigs, 475, 681 for poultry, 707 for sheep, 615 for stock, 475 Moisture, soil, 10 Molasses, 572 for silage, 437 Mole drainage, 58 Molinia, 361 Moorland, 44 Mould-board, 98 Mountain pastures, 359 sheep, 582, 597 Mower, 149 Mules, 656 Mustard, 353, 775 Mutations, 457 Nardus, 360 New Forest pony, 639 New Zealand white clover, 376 Nitrate of lime, 67 Nitrate of soda, 66 Nitrification, 30 Nitro-chalk, 69 Nitrogen, 25, 811 effect on plants, 65 fixation, 32 losses, 31, 812

manures, 64

Nurse-crop, 389

Nurseries, 723 Nutrition, principles, 473

OATS, 208, 796 cultivation, 214 diseases, 221 manuring, 218 milling, 209 quality, 209 threshing, 162 varieties, 211 Æstrum, 438, 542, 607, 647, 670, 675 Open-air dairying, 569 Orchards, 721 Organic manures, 80 Organic matter, decomposition, 29 Ox, points of, 515 Oxford Down sheep, 593

PANS, soil, 29 Paris green, 223 Park cattle, 532 Pasture, 400, 798 for horses, 650 improvement, 409 intensive treatment, 406 manuring, 400 mountain and heath, 359 nutritive value, 402 permanent, 391 stocking, Peas, 34, 327, 767 Peaty soils, 20, 42 Pedigree, 462 stockbreeding, 791 Percheron horse, 644 Perennial rye-grass, 365 Permanent grass, 396, 400 pH, 15 Phenothiazine, 618, 685 Phosphates in soil fertility, 70, 810 Phosphatic manures, 70 Phosphorus in plants, 25 Piggeries, 672 Pigs, 657, 787 bacon and pork types, 658 breeding, management and feeding, 669 breeds, 664 cross-bred, 662 efficiency of production, 675, 852 housing, 671 rate of growth, 678 recording, 663, 852 treatment for worms, 685 Pining (in sheep), 474 Placement of fertilizers, 92, 146, 264, 316 Plant foodstuffs, 24 improvement, 470

Plantations, 721 Planter, 173, 175 Plough, action of, 129 Ploughing, 109 Ploughs, 98 Polo pony, 634, 638 Ponies, 638 Porlock sheep, 602 Potash in maintenance of fertility, 75, 811 Potassic manures, 75 Potassium in plants, 25 Potato, 239, 768 boxing, 256 cultivation, 133, 258 digger, 171 diseases, 271 manuring, 262, 840 planter, 173, 261 plough, 109 seed, 251 sorter, 174 spraying, 265, 268 storing, 269 varieties, 241 Poultry, 687, 790 breeds, 689 brooding and rearing, 698 feeding, 705 housing, 700 keeping, systems of, 702 manure, 86 selection and breeding, 690 sex-linkage, 453, 693 table, 709 Preparation of food, 562, 572, 621, 654, 684, 706 Price changes, 834 Prices, Index, 816, 837 Protein equivalent, 477 Proteins, 475 Pulse crops, 321 Pure lines, 456 RADNOR sheep, 597 Rake, horse, 167 Rape, 351

Rations, examples of, 503. See also Cattle, Horse, Pig, Poultry, and Sheep feeding
Reaper, 151
Red clover, 373
Red Poll cattle, 529
Ridging plough, 109
"Rig "pigs, 678
Roads, 731
Rollers, 126
action of, 130
Romney Marsh sheep, 588

#### INDEX

Root cleaners and cutters, 177 crops, 282, 753 harvester, 176 seeds, place in farming system, 776 Roots, preparation for cattle, 572 preparation for cows, 562 preparation for sheep, 621, 625, 626 Roscommon sheep, 589 Rotary cultivators, 125 Rotation of crops, 802, 833 Rough Fell sheep, 599 Rough-stalked meadow grass, 371 " Runner calf," 544 Rust, 204 Rye, 235 Rye-grasses, 364 Ryeland sheep, 595 SAINFOIN, 342 Salt, 268, 300, 316, 418, 475, 561, 615, 681, 707 Sand, 7 Sandy heath, 43 Sandy loams, 19 soils, 19 Scouring from food, 80 Scuffler, 116, 120 Seaweed, 88 Seed-bed, preparation of, 128 Seed disinfection, 204, 222, 234, 271, 273 mixtures, 380 production of, 293, 303, 377, 776 purchase of, 379 sowing, 132, 143, 389 testing, 379 Selection in stockbreeding, 460 Separated milk, 547, 680 Sewage disposal, 61 Sex-linkage in poultry, 453, 693 Sex-linked inheritance, 453 Share, plough, 100 Sheep, 576, 778 acclimatization, 618 breeding, rearing and feeding, 605 breeds, 582 commercial types, 603 dentition, 606 dipping, 616, 619 farm, example, 817 fat weights, 623 fattening, 621 flushing, 608 folding, 610 grazing habit, 405 housing, 625 names of classes, 605 place in farming system, 778 rate of growth, 623 shearing, 616 stocking pastures, 651

Sheep-continued stomach worms, 617 ticks, 612 washing, 616 wintering, 609 Shetland pony, 638 sheep, 603 Shire horse, 640 Shoddy, 88 Shoeing horses, 655 Shorthorn cattle, 521 Shortwool sheep, 582 Shropshire sheep, 590 Silage, 425, 754, 794 weight of, 431 Silo, 425, 429 Silt, 8 Slag, 72 Slugs, 208 Smooth-stalked meadow grass, 371 Smut, 204, 221, 234 Sodium chlorate, 141 Soil, I acidity, 14 constitution and properties, 5 fertility, 36, 716, 808 fertility and plant life, 23 formation of, I improvement, 40 micro-organisms, 29 moisture, 10 organisms, 35 particles, 6 profile, 5 sterilization, 35 temperature, 12 types, 5, 17 Soilage, 355 Soot, 88 South Devon cattle, 530 South Devon sheep, 587 Southdown sheep, 589 Sowing seed, 132, 143, 389 Sprayers, 143 Spraying, 141, 265, 268, 275, 305 Stack elevator, 171 Stacker, 170 Stallions, licensed, 646 Starch equivalent, 491 State control, 859 Steamed bone flour, 71, 475, 561, 707 Stock, farm, live, 438, 746 improvement of, 457 production of food for, 791 summer, 747 winter, 751 Storage of grain, 166 Store cattle, 539, 552, 569, 572 lambs, 603 Straw, 237, 751, 766

Subsoil plough, 109 Suffolk horse, 643 sheep, 591 Sugar, extraction from beet, 308 Sugars, 478 Sugar-beet, 307, 773 cost of production, 847 cultivation, 311 diseases, 319 harvester, 319 manuring, 315 varieties, 309 Sulphate of ammonia, 65 Sulphur, 26 Sulphuric acid spraying, 141, 268 Superphosphate, 72 Sussex cattle, 526 Swaledale sheep, 598 Swath turner, 168 "Sway back," 474 Swedes, 282, 793. See also Turnips Synthetic farmyard manure, 86 Systems of farming, 800 TAKE-ALL, 205 Tall fescue, 369 oat-grass, 369 Tamworth pig, 668 Tedder, 169 Temperature, effect on food requirements, 489 effect on plant growth, 27 grain-drying, 165 soil, 12 Therm, 490 Thoroughbred horse, 636 Thresher and threshing, 156 Ticks, 612, 616, 618 Tillage, 128 Timothy grass, 367 Tractor costs, 739 ploughing, 113 Tractors, 180, 734 Trailers, 184 Transplanter, 175 Trefoil, 34, 377 Trifolium, 344 Turkeys, 712 Turnip crop, 282 cultivation, 133, 286 diseases, 293 drill, 146 flea beetle, 295 manuring, 289 production for stock, 793 seed, growing, 293 varieties, 283

#### UREA, 69

VEAL, 544 Vegetables, 776 Vetches, 34, 336 Virus diseases, 277 Vitamins, 303, 481 for poultry, 706

WAGES regulation, 761 Warping, 62 Washing sheep, 616 Water, effect on plant growth, 26 for cattle, 573 for cows, 562 for pigs, 684 for sheep, 620 supply, 731 table, 10, 50 Weed control, 134, 408, 766, 805 Weights of forage, 431, 729 Welsh Cob, 640 Black cattle, 531 mountain sheep, 600 pig, 669 pony, 640 Wensleydale sheep, 585 Wessex Saddleback pig, 669 West Highland cattle, 529 Western Horned sheep, 595 Isles pony, 638 Wheat, 186, 797 bulb-fly, 207 cultivation, 194 diseases, 203 manuring, 198 milling, 187 quality, 187 threshing, 162 varieties, 189, 472 Whey, 548 White clover, 375 scour, 546 Wiltshire Horned sheep, 595 Winter food for stock, 751 Wireworms, 206, 280, 320 Wool, 577 Worms, treatment in pigs, 685 treatment in sheep, 617

YEAST, dried, 485 Yolk. See Wool Yorkshire Fog, 373 Yorkshire pig, 664

ZINC, 26